In re Patent Application of:
HUANG ET AL
Serial No. **10/726,458**
Filed: **December 3, 2003**

REMARKS

Claims 1-11 are pending in this application.

Claims 8 and 11 have been cancelled.

Claims 1-10 stand rejected.

Claim 8 has been rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement.

In order to expedite the allowance of the remaining claims, claim 8 has been cancelled without prejudice.

Claims 1-10 have been rejected under 35 U.S.C. 102(b) as being anticipated by Sugaya et al. U.S. patent 6,055,092.

Regarding claim 1, the Examiner suggests that Sugaya et al. disclose all of the limitations of claim 1 including:

a gain flattening filter (GFF) in-line with at least one of the first and second spans of amplifying fiber for attenuating predetermined wavelengths of amplified light, WHEREIN A FIRST gain spectral response of the first and second spans of amplifying fibre including the GFF measured over the wavelength band has shape of a ripple that oscillates as a function of wavelength such that a plurality of peaks in the form of maxima and valleys in the form of minima occur at a plurality of different wavelengths, each different wavelength corresponding to a different channel; and,

a second compensating filter in-in line with one of the first and second spans of fiber having a SECOND spectral response that has a second plurality of peaks in the form of maxima and valleys in the form of minima, wherein the second spectral response is absent at least 50% of four most predominant peaks or valleys at channels where peaks or valleys, respectively, were present in the first spectral response, and WHEREIN a maximum ripple amplitude in the second spectral response is less than a maximum ripple amplitude in the first gain spectral response.

Applicants would like to point out that the invention, as claimed, requires the presence of two wavelength-dependent filters, which work together for provide a desired amplifier output response. The absence of one of the two filters, as claimed, will not yield Applicants' invention. It is acknowledged that these filters were not specifically defined in original claim 1 to be wavelength-dependent filters, having an output amplitude response which varies with wavelength; however, a GFF and filter to compensate for the response of the GFF is, by definition, wavelength-dependent, so as to flatten the amplitude of the output spectrum with wavelength. In the foregoing amendment to claim 1, applicants have more clearly defined this. Support for this amendment can be found in the specification as filed and in U.S. Provisional Patent Application No: 60/434,040 filed December 17, 2002, entitled "ULTRA FLAT GAIN OPTICAL AMPLIFIER," which is incorporated into the instant application by reference for all purposes.

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Applicants would further like to point out that providing a compensating filter, as claimed, without the GFF, as claimed, will not provide the benefit Applicants teach and claim; furthermore, providing the GFF without the compensating filter, as claimed, will not yield Applicants' invention.

Applicants are of the view that Sugaya et al. (the '092 patent) have not taught or suggested both of these critical elements defined in claim 1.

Although the '092 patent discloses a two stage amplifier with a first attenuator 11 and a second filter 15, it does not teach a GFF in line with a compensating filter as defined in the claims.

The Examiner suggests that, from Fig. 5, #11, Col. 5, Lines 16-30, the attenuator of Sugaya et al. is a disclosure of a GFF and, that

Fig. 5, #15, Col. 8, Lines 19-29, Col. 9, Lines 8-24, and Col. 8, Lines 52-59, disclose the second compensating filter.

A gain flattening filter (GFF) is well known in the art, and is defined in the instant specification, in accordance with its ordinary meaning to those skilled in the amplifier arts, as a filter which "attenuates certain bands of the output spectrum more than others, to attempt to provide a flatter output response". Thus, its purpose is to flatten the output spectrum. By definition, a GFF is a wavelength-dependent device for attenuating certain wavelengths more than others to flatten the output response.

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The variable attenuator 11, of Sugaya et al. as described in the patent, "maintains the level of the output light of the second-stage amplifier 1 at the predetermined constant level." Such devices are well known and are known to do this in a constant manner for all wavelengths. Thus, all wavelengths are attenuated the same constant amount; gain flattening cannot be achieved by use of attenuator 11. All peaks and valley are lowered by a same amount without flattening.

As described in '092 patent, attenuator 11 simply attenuates all wavelengths, so that the output is maintained at a constant level, whereas gain flattening filters for amplifiers, as described above, are designed to attenuate certain wavelengths, while not attenuating certain others to obtain a flat output response. There is no disclosure that attenuator 11 attenuates certain wavelengths more than others for the purposes of gain flattening.

Claim 1 also recites a second compensating filter which the Examiner suggests is found in the '092 patent as corresponding to element 15, in Fig. 5, Col 8, lines 19-29, Col 9, lines 8-24, Col 8, lines 52-59.

Applicants acknowledge that the filter 15 is said to have a gain vs. wavelength characteristic, which compensates for gain vs. wavelength characteristics of the first stage amplifier; however, claim 1 of the instant application defines the compensating filter as having a SECOND spectral response that has a second plurality of peaks in the form of maxima and valleys in the form of minima,

wherein the second spectral response is absent at least 50% of four most predominant peaks or valleys at channels where peaks or valleys, respectively, were present in the first spectral response, and WHEREIN a maximum ripple amplitude in the second spectral response is less than a maximum ripple amplitude in the first gain spectral response.

There is no teaching in '092 of providing a second filter wherein the maximum ripple amplitude in the second spectral response is less than a maximum ripple amplitude in the first gain spectral response.

In summary, Applicants' claims recite two filters. Both of these filters are wavelength-dependent filters, and both of these filters have the function of flattening the amplifier spectral gain performance. Namely, both are gain- flattening filters; however, the second claimed filter is also a compensating filter.

The provisional application, from which the instant application claims priority as mentioned hereinabove, discloses that the compensating filter is wavelength dependent.

In the provisional application the following text is found:

"The DI discloses adding a compensating filter to each EDFA as they are manufactured. The function of this filter is to further flatten the amplifier spectral gain performance…."

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In order to more clearly define the instant invention, and to more clearly distinguish from the teaching of the '092 patent, claim 1 has been amended, as discussed above.

Claim 3 has been rejected under U.S.C. 103(a) as being unpatentable over Sugaya as applied to claim 1.

Claim 3 defines: A multistage optical amplifier as defined in claim 1 wherein the second compensating filter is a Bragg grating.

The Examiner has suggested that since the US Patent to Leyva et al, No. 6,327,405, teaches that a Bragg grating is a type of filter, and it is advantageous to use a Bragg grating in an optical filter, it would be obvious to use such a filter with the teachings of Sugaya to yield the claimed invention.

It should be noted that the '405 patent is related to temperature stabilization of Bragg gratings, and that their periodicity (and hence their wavelength response) is known to change with a change in temperature. However, Leyva et al. make no mention of optical amplifiers or the use of Bragg grating in an optical amplifier, more specifically, for use as a compensating gain flattening filter. Applicants have found that Bragg gratings typically have a random spectral component that is a function of standard manufacturing processes. Employing an optical filter that has randomness in its output would seem to be a disadvantage; however, according to the present invention, it is this random property that is used to an advantage. Thus, using a Bragg grating

as a compensating filter is particularly advantageous over other filters where this property is less accentuated.

Neither Leyva or Sugaya et al. teach the use of a Bragg grating in an amplifier circuit as a compensating filter. As the Applicants have pointed out, using a Bragg grating instead of other types of filters has particular and unexpected advantages.

As for claim 4, Leyva et al certainly do not disclose a multistage optical amplifier as defined in claim 2, wherein the second compensating filter is a Bragg grating, and wherein the second spectral response has minima at at least 10% of wavelengths where peaks were present in the first spectral response; nor does using Leyva et al's standard Bragg filter in the circuit of Sugaya et al. produce these features. Sugaya et al. do not have the combination of GFF and compensating filter, and neither Sugaya et al. nor Leyva et al disclose that the spectral response has minima at at least 10% of wavelengths where peaks were present in the first spectral response.

As Applicants have pointed out, using a Bragg grating instead of other known more typical filters in the amplifier as a compensating filter has unexpected advantages in introducing some randomness into the response to yield an overall lessened ripple.

In view of the foregoing amendment to claim 1 and the explanation of the differences between the claimed invention and the prior art of record, Applicants respectfully request

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reconsideration of the outstanding rejections over the cited prior art.

Should any minor informalities need to be addressed, the Examiner is encouraged to contact the undersigned attorney at the telephone number listed below.

Please charge any shortage in fees due in connection with the filing of this paper, including Extension of Time fees, to Deposit Account No. 50-1465 and please credit any excess fees to such deposit account.

Respectfully submitted,

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CERTIFICATE OF FACSIMILE TRANSMISSION

I HEREBY CERTIFY that the foregoing correspondence has been forwarded via facsimile number **571-273-8300** to MAIL STOP AMENDMENT, COMMISSIONER FOR PATENTS, this 18 day of October 2005.

D. Kallemeyn